

PROJECT MANAGEMENT ASPECTS*

The knowledge and correct execution of project management techniques is the key to the success for an overwhelming range of activities, reaching from e.g. planning the extension of a house - up to the execution of mega-scale construction projects.

By definition, a project is a finite endeavor (having specific start and completion dates) undertaken to create a unique product or service which brings about beneficial change or added value. Project management hence is the discipline of using tools for systematic planning, documenting, controlling and directing resources to reach specific goals and objectives. In order to deal with complex problems and multiple variables, projects have to be subdivided into simple activities and have to follow a step-by-step strategy to perform their tasks. It is a standard practice to divide projects into the following stages: initiating, planning, executing and closing. A successful project is the one that optimizes its limited resources to provide entire client satisfaction, finalizing on time, within budget and complying with quality standards, including environmental aspects.

Project Management Body of Knowledge (PMBOK)

PMBOK is a project management guide, and an internationally recognized standard that provides the fundamentals of project management and applies to a wide range of projects, including construction, software, engineering, automotive, etc. The PMBOK Guide is process-based, meaning it describes work as being accomplished by processes. This approach is consistent with other management standards such as ISO.

The 3rd edition of the Guide recognizes 44 processes that fall into:

- five basic process groups (see figs. 1,2 & 3)
- nine knowledge areas(see figs. 1 & 4).

The five basic processes overlap and interact throughout the project life cycle and its various phases. Each of the knowledge areas contains the processes that need to be accomplished within its discipline in order to achieve an effective project management program. Furthermore, the processes also fall into one of the five basic process groups, creating a matrix structure where every process can be related to one knowledge area and one process group (See fig. 1).

Management Areas	Initiating	Planning	Execution	Monitor & Control	Closing
SCOPE	0	3	0	2	0
TIME	0	5	0	1	0
COST	0	2	0	1	0
QUALITY	0	1	1	1	0
HUMAN RESOURCE	0	1	2	1	0
COMMUNICATION	0	1	1	2	0
RISK	0	5	0	1	0
PROCUREMENT	0	2	2	1	1
INTEGRATION	2	1	1	2	1
Total processes (accord. PMBOK)	2	21	7	12	2
in %	5%	48%	16%	27%	5%

Fig. 1. Matrix structure between nine basic knowledge areas (left) and basic process groups (top), indicating the number of processes involved in each matrix element, according to PMBOK. Planning involves approximately half of the total of 44 PMBOK processes. Control accounts for more than 25% of the processes.

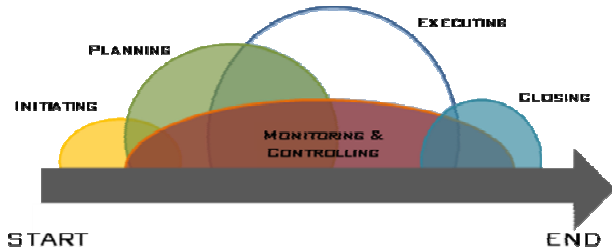


Fig 2. Graphical display of the development of a specific project through time. From project start (initial stage) to completion (final stage), a number of different phases come into play. According to PMBOK, these are grouped into initiating, planning, executing, controlling and closing stages. The intensity of each one of these phases and its corresponding processes varies through the project development.

The Controlling and Monitoring activities assure that project tasks are executed as planned, and remains active from the start of the project until its closure, i.e. the final acceptance of its deliverables.

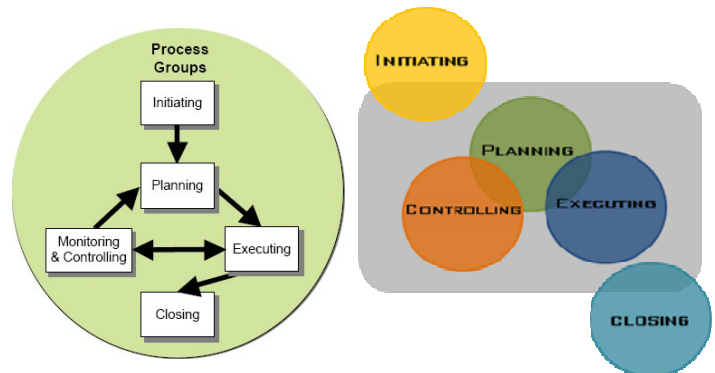
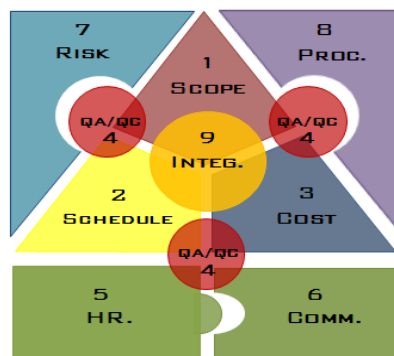


Fig. 3. The five basic process groups: Left: arrows indicate that the cycle planning-executing-monitoring is an iterative process. Right: the different process groups generally do not take place in a sequential order – overlaps are very common.



- 1- Scope Management
- 2- Time Management
- 3- Cost Management
- 4- Quality Management
- 5- Human Resource Management
- 6- Communication Management
- 7- Risk Management
- 8- Procurement Management
- 9- Integration Management

Fig. 4. Nine basic knowledge areas of project management. The numbers on the left correspond to the different project management areas listed at the right. As shown in this illustration, Integration and Quality management play a central role in the process, as their role is to assure the correct outcome between scope, time and costs.

Relevant Project Management Documents

Project documentation represents a vital aspect in Project Management (PM). In this context special attention is given to the following two documentation tools: the project Handbook and the Project Control Book.

The **Project Handbook**, which serves as an overall guide on how projects will be executed in a specific enterprise, includes the PM reference model, PM software model and PM communication scheme, (see fig. 5). It describes the following type of information:

- All measurable routines of a standard project
- The to do's of all involved project members with set durations
- All measurable results (documents).

The project handbook is a living document and the reference for the evaluation of any project process.

The **Project Control Book** is based on the Project Handbook, but is specific for each particular Project which a Company carries through. This document supports the visualization and steering of costs, times, resources, qualities and quantities. The document provides the following general type of information:

- Project introduction / Project break-down (see fig. 6)
- Project specific rules and project organization chart
- The key contract aspects list

An overview of the typical Project Book chapters for engineering project is presented as follows:

1. Introduction:

- Introduces project partners/costumer and the contractual relations between them
- Provides the Overall Project Break-Down

2. Execution plan:

- General Work break-down structure (see fig. 6)
- General split of work matrix schedule
- Complete list of deliverables
- Schedule
- Interface managements (to costumer & internal)

3. Details:

I. General Project Management Issues

- Project Team Introduction and Organization
- Project Communications
- Project guidelines & procedures. Includes engineering and design process and design preview process

II. Regulatory Issues

Includes the requirements, procedures and responsibilities for obtaining the necessary approvals & licenses

III. Architectural, Civil & Structural Design Issues

- General (site & plant arrangement drawings, calculation and design drawing reviews, shop and vendor drawing reviews)
- Geotechnical / Civil Works / Structural Works / Architectural Works Issues

IV. Mechanical Design Issues

V. Electrical Design Issues

VI. Testing Issues / VII. Transport Issues

VIII. Supervision / IX. Training

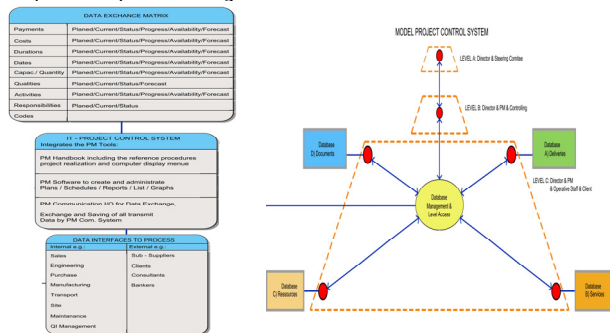


Fig. 5: Project Software Model. Supports Data Base, Statistics, Communication Interfaces, Archive & Document Management. The system includes a Communication Scheme that grants a link to all project members and controlled data exchange during the project life cycle. Furthermore, it allows access to standard display, data format and project "Blackboard".

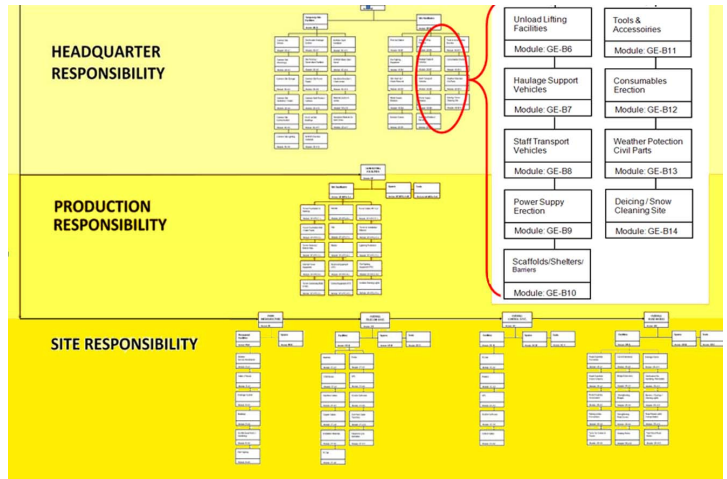


Figure 6: Typical project breakdown structure. The project has been divided into different task modules. Each module has been provided with a reference number (see insert) that leads to the pertinent documents and procedures, necessary to accomplish the tasks. Responsibilities are being provided on a general level: Headquarter, Production & Site (see left).

PROJECT MANAGEMENT ASPECTS AT EC

As project management plays a fundamental role for EC, the Company has developed its organizational structure accordingly (as depicted in figs. 7&8). Projects are executed in a matrix structure that encompasses seven different management areas acting through the different project stages: Initiating/Planning/Executing/Closing. Each project at EC is managed by a project manager, who acts as the sole interface between the customer and the different project team members. Another significant management tool is EC's own web-based communication system (in practice over 7 years). The system allows for efficient remote project progress monitoring by granting protected access to the deliverables.

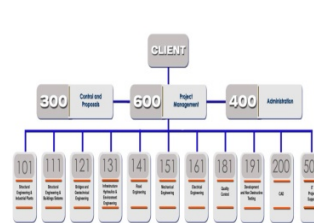


Figure 7: General Organization scheme. Central role of project management unit (area 600) at EC. The different Engineering Units involved in specific project may be either internal or external (partner offices in Latin America and Europe).

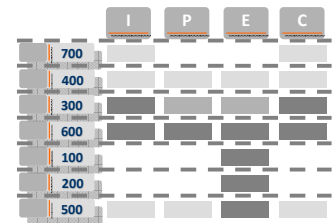


Figure 8: EC Matrix organization for project execution. The shading intensity of the coloured matrix element indicates the grade of involvement of EC's organizational Units during a specific project stage.

*This article is based on contributions provided by Ing. Carlos Brenes, VP Project Management from GCI, Costa Rica (1); Dipl.-Ing. Uwe Brauckmann, Senior Project Manager, Germany (2); Dr. Rainer Christoph, Key Accounts Manager EC (3); and Dr.-Ing. Edwin Portillo, CEO from EC (4).

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